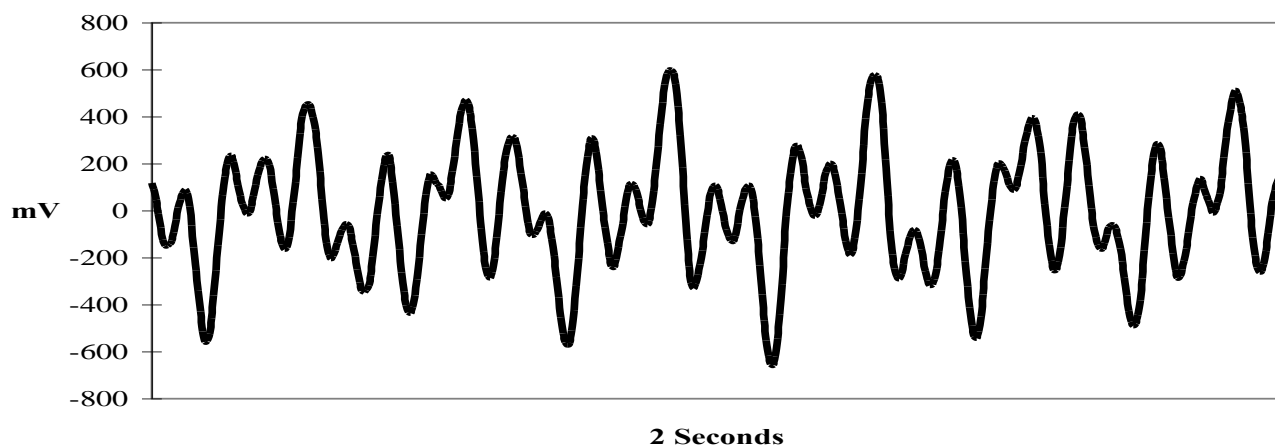


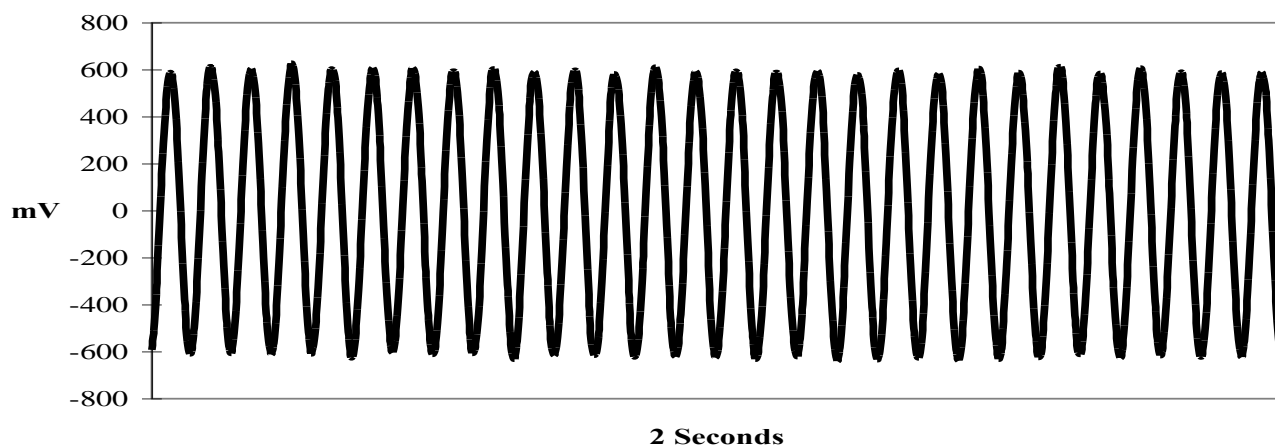
## What Are Binaural Beats?

The sensation of auditory binaural beats occurs when two coherent sounds of nearly similar frequencies are presented one to each ear with stereo headphones or speakers. The brain integrates the two signals, producing a sensation of a third sound called the binaural beat. Binaural beats originate in the brainstem's superior olivary nucleus, the site of contralateral integration of auditory input. This auditory sensation is neurologically conveyed to the reticular formation and simultaneously volume conducted to the cortex where it can be objectively measured as an EEG frequency-following response. The frequency-following response provides proof that the sensation of binaural beating has a neurological efficacy. Hemi-Sync binaural beats are unique in that they are designed to be complex brain-wave-like patterns rather than simple sine waves. (See illustrations below.)

### Hemi-Sync (Brain Wave) Binaural Beat



### Sine Wave Binaural Beat



## How Hemi-Sync Alters States of Consciousness

Hemi-Sync influences consciousness by providing *information* to the brain's reticular activating system (RAS). The word reticular means “net-like” and the neural reticular formation itself is a large, net-like diffuse area of the brainstem (Anch et al. 1988). The RAS controls arousal, attention, and

awareness – the elements of consciousness itself (Tice & Steinberg 1989; Empson 1986). How we interpret, respond, and react to *information* (internal stimuli, feelings, attitudes, and beliefs as well as external sensory stimuli) is managed by the brain's reticular formation stimulating the thalamus and cortex, and controlling attentiveness and level of arousal (Empson 1986).

Listening to Hemi-Sync provides *information* to the RAS because the unique Hemi-Sync binaural-beat wave form is accepted as a brain-wave pattern by the reticular formation. This *information* encompasses the character, quality, and traits of the state of consciousness that the Hemi-Sync pattern represents. If internal stimuli, feelings, attitudes, beliefs, and external sensory stimuli are not in conflict with this *information*, the RAS will alter states of consciousness to match the Hemi-Sync stimulus as a natural function of maintaining homeostasis. The brain automatically and actively regulates all body functions to maintain homeostasis – an internal equilibrium (Swann et al. 1982; Green & Green 1977). In a natural and constant attempt to maintain homeostasis the RAS actively monitors and continues the cortical replication of ongoing brain-wave states (unless, of course, there is reason to make an adjustment due to new information from internal sources or external sensory input). However, because of the natural brain-wave-like characteristics and persistence of the Hemi-Sync sound field, the RAS initiates cortical replication of the Hemi-Sync stimulus, *believing* the Hemi-Sync pattern to be the ongoing brain-wave state. As time passes, the RAS monitors both the internal and external environment and the state of consciousness itself to determine, from moment to moment, its suitability for dealing with existing conditions. As long as no conflicts develop, the RAS naturally continues aligning the character, quality, and traits of consciousness with the *information* in the brain-wave-like pattern of the Hemi-Sync sound.

## We Know It Works

In objective, measurable terms EEG-based research provides evidence of Hemi-Sync's influence on consciousness. Since the RAS regulates cortical EEG (Swann et al. 1982), monitoring EEG chronicles performance of the RAS. There have been several *free-running* EEG studies (Hiew 1995; Foster 1990; Sadigh 1990, among others) which suggest that Hemi-Sync induces alterations in EEG. Because the RAS is responsible for regulating EEG (Swann et al. 1982; Empson 1986), these studies document measurable changes in RAS function during exposure to Hemi-Sync.



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## References

- Anch, A.M., Browman, C.P., Mitler, M.M. & Walsh, J.K. (1988). *Sleep: A Scientific Perspective*. (Englewood Cliffs: Prentice Hall), pp. 96-97.
- Atwater, F.H. (1996). Binaural beats and the frequency-following response: a pilot study. The Monroe Institute.

- Empson, J. (1986). *Human Brainwaves: The Psychological significance of the Electroencephalogram*. (London: The Macmillan Press Ltd.)
- Foster, D. (1990). <http://www.monroeinstitute.org/research/alpha-binarual-beat.html>
- Green, E. & Green, A. (1977). *Beyond Biofeedback*. pp. 172-177. (Delacorte Press)
- Hiew, C.C. (1995). Hemi-Sync into creativity. *Hemi-Sync Journal*, XIII(1), pp. iii-vi.
- Hink, R.F., Kodera, K., Yamada, O., Kaga, K., & Suzuki, J. (1980). Binaural interaction of a beating frequency-following response. *Audiology*, 19, pp. 36-43.
- Marsh, J.T., Brown, W.S., & Smith, J.C. (1975). Far-field recorded frequency-following responses: Correlates of low pitch auditory perception in humans. *Electroencephalography and Clinical Neurophysiology*, 38, pp. 113-119.
- Oster, G. (1973). Auditory beats in the brain. *Scientific American*, 229, pp. 94-102.
- Owens, J.E. & Atwater, F.H. (1995). EEG correlates of an induced altered state of consciousness: "mind awake/body asleep". Submitted for publication.
- Sadigh, M. (1990). <http://www.monroeinstitute.org/research/effects-of-hemi-sync-on-electrocortical-activity.html>
- Smith, J.C., Marsh, J.T., & Brown, W.S. (1975). Far-field recorded frequency following responses: evidence for the locus of brainstem sources. *Electroencephalography and Clinical Neurophysiology*, 39, pp. 465-472.
- Smith, J.C., Marsh, J.T., Greenberg, S., & Brown, W.S. (1978). Human auditory frequency-following responses to a missing fundamental. *Science*, 201, pp. 639-641.
- Swann, R., Bosanko, S., Cohen, R., Midgley, R., & Seed, K.M. (1982). *The Brain - A User's Manual*. p. 92. (New York: G. P. Putnam's Sons).
- Tice, L. E. & Steinberg, A. (1989). *A Better World, A Better You*. pp. 57-62. (New Jersey: Prentice Hall)

